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RESEARCH ENGINEER

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the station

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the cover

Contact prints on the cover show Georgia Tech research efforts about upper atmospheric studies at Walton Beach, Florida, particle acceleration at the Radio-isotopes Laboratory, health sciences at the Bio-engineering Laboratory, and solid state physics at the main research building of the Engineering Experiment Station.

Cover prints and photographs by Bill Diehl, Jr., Cecil Phillips, Van Toole.

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In the Middle Ages every village had its craftsmen. These craftsmen worked in a variety of areas from candlestick maker to blacksmith and from shoemaker to silversmith. Over the years, because of the individual craftsman's services, dependability, and workmanship, he developed regular clientele who remained his faithful customers. His reputation and stable business would soon become known and eventually the small, beginning craftsman would emerge as a significant and dependable leader in his village and surrounding countryside.

In a way, Georgia Tech resembles the successful craftsman of that era. Its tough undergraduate courses developed engineers and scientists who turned into conscientious, hard-working employees for companies across the country. In recent years, its Graduate Division has followed the example set by the undergraduate schools.

And, in the past 26 years, through outstanding work in research, Tech's Engineering Experiment Station has gained the reputation as a dependable leader throughout the southeast and the country. From a modest $12,000 origin in 1934, Georgia Tech's research operation has now expanded over 300 times. Areas in which the Station was working in its first year are still part of today's research activities here on the campus. Research divisions have grown to such an extent that new divisions and branches had to be created. Employees of the past are now returning to Georgia Tech to work in research. The turnover of the engineer and the scientist of the past ten years has decreased to a stabilized personnel count.

Basically one of consolidation, the research year covered in the annual report in this issue exemplifies the fact that Georgia Tech's Engineering Experiment Station is a firmly established "craftsman" not only in the State and surrounding countryside but throughout the world.

E. D. Harrison *President*

Photograph—Bill Diehl, Jr.

Research with Purpose

by James E. Boyd, Director
Georgia Tech Engineering
Experiment Station

IN A MODERN research laboratory at Oak Ridge, Tennessee, a Georgia Tech nuclear physicist—awaiting completion of the Tech research reactor—conducts neutron diffraction experiments to determine magnetic structures of materials.

In another laboratory located in a temporary building on the Tech campus, an electrical engineer uses microwave techniques to study magnetic properties of materials.

In Tech's main Research Building, a chemical engineer uses extremely low temperature equipment to determine changes in magnetic properties of materials.

In Tech's solid state physics laboratory physicists, engineers, and chemists utilize extremely high vacuum equipment to study the surface properties of materials.

Different professional training . . . different research techniques . . . different research divisions. Yet, all of them are part of a new solid state program—an excellent example of interdisciplinary research effort toward a common goal.

Tech's radioisotopes development program for the Office of Isotopes Development of the Atomic Energy Commission is another fine example of this interdisciplinary approach to research. Under this program, now just a year old, civil engineers, chemical engineers, radiation chemists and physicists are working on many important problems concerned with the use of radioisotopes by American industry.

The concept of today's Georgia Tech is

interdisciplinary. Georgia Tech's research plays the supporting role in the drama of education. But, without a strong research program built on an interdisciplinary foundation, technological education cannot hope to keep abreast of times in this fast-moving age.

On the pages that follow, the research highlights of the past year illustrate the overall state of order and unity of purpose that exists at Georgia Tech through its common educational and research goals.

The 26th Year

The Station's research growth for 1959-1960 was unprecedented for Georgia Tech and, in retrospect, inconceivable under the congested research conditions. This year's new high in research propagated whole divisions, many new staff members, and a great increase of scientific knowledge and understanding. Total dollar volume of research effort increased by 27 per cent to $3,767,000. This voluminous amount of new activity caused 78 members to be added to the Station's staff. New divisions and branches were established. Several major items of research equipment were obtained. But, the amount of working space remained constant.

The increase in the number of projects, the new fields added to the Station's capabilities, the additional personnel needed to carry out this increased volume, and the already crowded conditions combined to push the working space problem to the acute stage. Research areas in which Georgia Tech should be working in order to better serve the State and to create new opportunities for its people are not being developed only because space is not available. Technical areas where the Station has already established sponsor confidence and a national reputation are being endangered because space is not available for required staffing. Able graduate students who need

financial assistance or room to work with experimental apparatus must be denied employment even though outside funds are available to pay all costs. In short, the future of research at Georgia Tech now depends largely on the provision of working space for research scientists, faculty associates, and graduate students who participate in sponsored research programs.

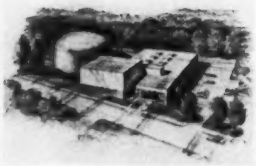
Services to Georgia Tech

Education, employment, and service to Georgia Tech faculty and students also reached a record high during this past year.

The Station's research program provided stimulating research activity for 117 faculty members. One hundred and eighteen graduate students and 183 undergraduate students gained valuable research experience and needed financial help through employment by the Station. Many of these could not have continued their graduate work without this financial assistance. A large number of graduate theses were made possible through work on Station projects or were facilitated by equipment and staff assistance in the Computer Center, the X-ray Laboratory and other laboratories. The Station's total support of faculty research and the graduate program was much larger than ever before.

Many seminars and informative talks were conducted for faculty, staff members, and students by Station personnel during the year. Machine translation and digital computer instruction are representative of these special lectures.

Various schools and departments utilized specialized equipment of Station divisions. The Analog Computer Laboratory and the X-ray diffraction laboratory were used for instructional purposes. The Computer Center, Radioisotopes and Bioengineering Laboratory, and other areas were used by student classes and faculty from many departments.



PROPOSED ATOMIC REACTOR

Services to the State

The communities of Brunswick, Columbus, and Macon will reap the benefits of nearly-completed projects by the Station's Industrial Development Branch. Work at Valdosta was completed last year. Contracts with the Rome-Floyd County Planning Commission and the city of Thomasville mean that these areas will be analyzed to determine their industrial and economic potentials. Other projects of special significance for the State are those undertaken for the State Highway Department (together with the U. S. Bureau of Public Roads) to find ways of improving the quality of roads and to reduce the costs of construction. These investigations involved new types of pavements, improvements in pavements using Georgia materials, and highway systems.

Services to the Nation

Georgia Tech research plays an important part in the nation's defense. Seventy-four projects were sponsored by various agencies of the Department of Defense during the year. Many of these projects were concerned with basic research and involved strong participation of both faculty and students. Urgent demands are being made upon Tech's research resources now, when the safety and strength of the free world depend so greatly on maintaining a high level of science and technology.

Research for other government agencies, such as the Atomic Energy Commission and National Institutes of Health, continues to grow. During the year, 64 projects were active in this category.

Services to Industry

One thousand and eighty-six small businesses in the State of Georgia were contacted this past year in an effort by the Industrial Development Branch to identify their problems. This information will provide the basis for developing more practical and useful

management and technical assistance programs for small businesses in the near future. But, all projects initiated were not of such a general and broad nature—many programs included projects of direct assistance to individual industrial firms. The Branch provided such information as labor resources, opportunities for diversification, and data on other questions best suited to research at the university level.

Georgia Tech Research Institute

The Georgia Tech Research Institute is a non-profit Georgia corporation closely integrated with the Engineering Experiment Station. As the major contracting agency, the Research Institute negotiated 126 new research contracts for Georgia Tech during the year. Its patent department administered patents resulting from Station research.

The Research Institute also assisted in the promotion of Georgia Tech research programs by helping to maintain outside interest and support. Its personnel participated actively in workshops, pilot studies, and organizational activities to improve Federal government-university research relations. As a further aid to the school and the Station, the Institute continued to make available funds for the furtherance of research on the campus.

The 1959-60 officers of the Georgia Tech Research Institute were William E. Mitchell, Chairman of the Board (see back cover of this issue); Fuller E. Callaway, Jr., Vice-chairman; Harry L. Baker, Jr., President; James E. Boyd, Secretary; William B. Harrison, Assistant Secretary; and Paul Weber, Treasurer. The members of the Board of Trustees are James E. Boyd, Harllee Branch, Jr., Fuller E. Callaway, Jr., M. A. Ferst, Edwin D. Harrison, William E. Mitchell, Frederick G. Storey, Ray L. Sweigert, William B. Turner, Paul Weber, and Robert H. White.

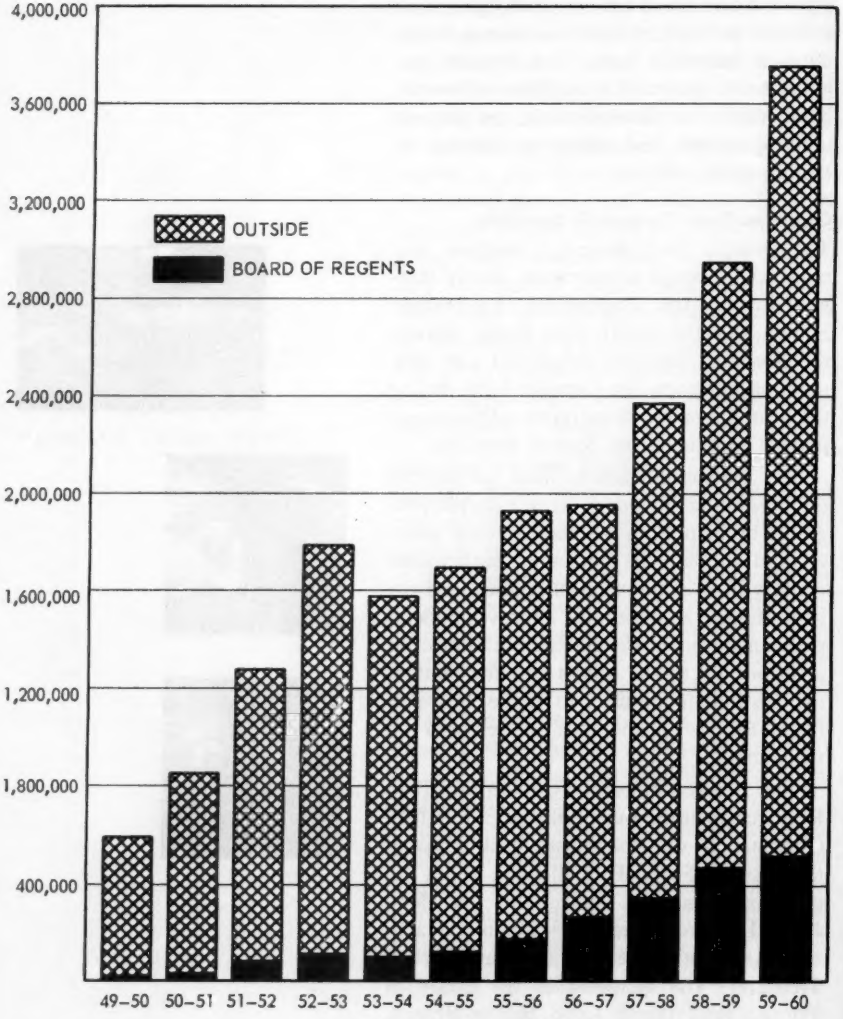


Figure 1. The Station's Operating Income by Source Over the Past Decade.

Members assigned to divisions, branches, or service groups participate in projects classified under Georgia Tech's research system as

TECHNICAL OPERATIONS

W. C. WHITLEY, Chief

the

CHEMICAL SCIENCES

division

CLAYS, TEXTILES, and naval stores only represent a few of the many important projects that the Chemical Sciences Division has undertaken for the State of Georgia.

Other programs of this Division have continued in such areas as air pollution, bacteriology, bioengineering, catalysis, chromatography, clay chemistry, concrete products, corrosion, fine particles, heat transfer, industrial waste, instrumentation, kinetics, meteorology, naval stores chemistry, organic chemistry, photochemistry, radiation chemistry, radiation biology, radioisotopes, solar distillation, textile chemistry, textile fibers, and water quality.

Work in fine particles has continued to expand under the direction of Dr. Clyde

Orr, Jr. During the year the Micromeritics Branch was established and Dr. Orr was appointed Head of the Branch. The Branch is now operating with a total budget of approximately $150,000 and the work of this group is becoming widely known.

The work in bioengineering continues to expand and the future for this area of the Division's program looks promising. During the year the Bioengineering Branch was established and Mr. T. W. Kethley was appointed its Head. Several members of the staff of this Branch will be shared with the School of Applied Biology and the Bioengineering Branch.

The contract dealing with the expansion of uses for radioisotopes was renewed again last year, and an allocation for new research programs was made. Several programs utilizing the cesium-137 irradiator were started and provisions are being made for the use of this facility on a service basis to other research organizations. Georgia Tech's excellent facilities and staff for radioisotopes research and the good support being furnished by the Office of Isotopes Development of AEC have developed a strong and well-recognized operation in this area.

Two other projects added during the year are of great interest. One is on the development of an improved solar still for the purification of saline water. Encouraging results have already been obtained. The second deals with the determination of radioactivity in water supplies. The first report on this project has prompted very favorable comments.

A proposal has been submitted to the National Science Foundation for support of a three-year program in low temperature chemistry and cryogenic engineering. This is a very fine program in basic chemical research and will give desirable support to Tech's graduate program.

F. BELLINGER, Chief

the

MATERIAL SCIENCES

division

THE MAJOR PORTION of the growth of the Material Sciences Division took place in the Ceramics Branch, whose work has received national and international attention. New work was undertaken on the problems of ceramic tooling and telescope reflectors, while work was expanded in the nuclear and rocket materials fields.

The Branch continued to investigate the properties and new applications of slip cast fused silica, "the Cinderella ceramic." Various forms of fused silica have been evaluated for use in areas where extremely high stagnation temperatures and supersonic velocities will be encountered. This evaluation consists of equilibrium and dynamic

measurements of thermal and mechanical properties such as thermal conductivity, thermal diffusivity, resistance to thermal shock, strength, and density. The dynamic evaluations are conducted with the aid of a small oxyhydrogen rocket motor and a 40 KW plasma arc. In the near future an 80 KW plasma arc and vacuum tunnel will be in operation which will provide a Mach 3 to 4 gas stream.

Other studies of slip cast fused silica have concerned its application to: fuel elements for nuclear reactors; permanent foundry molds; stainless steel forming dies and reflectors for astronomical telescopes. The forming die project was successfully concluded, and the dies are being used by the sponsor in the production of stainless steel plates for aircraft. The other fused silica studies have shown much promise and are being continued.

Among the other significant work in ceramics is a project conducted in the School of Ceramic Engineering. In this three-year study, basic knowledge is sought concerning mass transport phenomena and imperfections in metallic oxide (ceramic) materials. The inert gases were used as diffusing elements, and UO_2 and $A1_2O_3$ were selected as the oxides for study. During 1959-60, the quantitative determination of helium diffusion through single crystal and polycrystalline $A1_2O_3$ was made over a temperature range of 25° to 900° C. The knowledge obtained in this work is expected to be useful in the design of nuclear reactors, in which the diffusivity of certain materials is very important.

At the beginning of the year the Mineral Engineering Group was established. Several projects concerned with the mineral and water resources of Georgia were completed during the year, including studies for the Southeast River Basin Commission.

T. W. JACKSON, Chief

the

MECHANICAL SCIENCES

division

A DAM OF 600 feet height is being built on the Dez River in Iran. Its circular spillways and ogee inlet are some features designed at the Civil Engineering Laboratory as a part of the hydraulics activity of the Mechanical Sciences Division. Studies about the flow of water over highway embankments, weirs and spillways, and characteristics of various shaped weirs were other representative projects of this very active group.

Research in civil engineering was centered around the projects being done for the

State Highway Department and the Federal Bureau of Public Roads. These projects concerned soil stabilization by use of Portland cement or other admixtures, the use of light-weight aggregate concrete for prestressed highway bridges, the design of asphalt mixes using Georgia aggregates, and the determination of the vertical stresses produced in the foundation for a highway pavement by truck tire loads on the pavement surface. Other studies conducted in the Highway Research Laboratory of the School of Civil Engineering included: applications of digital computation to studies in photogrammetry and undergraduate problems in structures; methods of deriving discharge hydrographs by use of the unit hydrograph theory; and calibration and proof-testing of cells for static load tests of the Saturn missile.

AERONAUTICAL ENGINEERING

Research in aeronautical engineering during the year included a large number of studies in the nine-foot wind tunnel. These projects involved flutter and force investigations on helicopter and aircraft fuselages, evaluation of low speed aerodynamic characteristics of small rockets equipped with drag brakes and various fin modifications, and aerodynamic characteristics of control surfaces for submarine hulls. In addition to the wind tunnel studies theoretical and experimental work was continued on a basic study of the flow about a helicopter model rotor during transition from hovering to low speed forward flight in the presence of a ground plane. Also, theoretical and experimental studies were undertaken to determine the optimum blade bound vortex distributions for shrouded single rotation propellers, and the flow studies in pneumatic pressure sensing systems of ballistic missiles were continued.

MECHANICAL ENGINEERING

Projects conducted in the Research Laboratory of the School of Mechanical Engineering continued to include studies concerned with the theoretical and experimental aspects of the effects of acoustic vibrations on heat transfer and fluid flow. Because resonant acoustic effects such as "screech" in rockets and jet engines cause structural failures due to increases in heat transfer coefficients and structural vibrations, the problem of understanding the phenomenon is important.

Experiment Station work was conducted in the area of electro-mechanical devices for the Department of Defense. Two of the three projects concerned equipment for medical research and the other a propulsion system for navy vehicles. The medical projects were the development of a human angular accelerator for the Army and the development of a rotating chair device for stimulation of the semi-circular canals of the inner ear for the Air Force's School of Aviation Medicine. When completed and in operation these devices will yield basic data on the ability of man to orient himself in his new element, space.

Several interesting projects were conducted for industrial sponsors. One of the more basic was an analytical investigation of two-phase vapor-liquid ratio measuring systems. In the new high speed airplanes and rockets, vaporization of fuels and liquids is critical and the need to know vapor-liquid ratios is of prime importance. For another industrial sponsor, a prototype machine was designed and fabricated which would package several hundred pounds of meat per hour. The objective of a related project was to improve meat cutting bandsaw blades. This project resulted in recommendations which increased the life and sharpness of the sponsor's saw blades several fold.

A. L. BENNETT, Chief

the

PHYSICAL SCIENCES

division

ON NOVEMBER 1, 1959 the Physical Sciences Division which consisted of five large branches and the AC Network Analyzer and which accounted for approximately half of the Station's total research effort, was reorganized by the creation of the Electronics Division consisting of the Communications and Radar Branches. In addition, following the resignation of W. W. Wright, part of the Analysis Branch was assigned to the Rich Electronic Computer Center and was renamed the Statistical Analysis Group. The remainder of the Analysis Branch was assigned to the Communications Branch. The Physics Branch, Defense Branch, the AC Network Analyzer, and the research projects on meteor propagation and quartz crystal frequency control remained in the Physical Sciences Division.

PHYSICS BRANCH

In the Physics Branch the program of ion and molecular studies include work on ion mobilities, which has been in progress for a number of years; newly instituted fun-

damental investigations of collision processes, an understanding of which is of great importance in the development of controlled nuclear fusion; and studies of the upper atmosphere. The latter research centered around the Air Force's Project Firefly, in which Tech personnel made observations of controlled releases of chemicals carried to altitudes of 50-80 miles by rockets launched from Eglin Air Force Base, Florida. The series of 13 rockets fired in September and October of 1959 amounted to one of the most extensive experiments of this type ever made. The data are presently being analyzed and a much larger experiment, involving approximately 35 rockets, is set for the summer of 1960.

The expansion of research activity in solid state physics has been rapid. Contracts have been received with charters sufficiently broad to permit a wide variety of fundamental studies on the nature of solids. A principal area of interest continues to be thin films. A versatile new ultra high vacuum facility has been nearly completed. This facility will permit study of thin films under more carefully controlled conditions than has previously been possible.

Nuclear physics studies during the year have included theoretical investigations of nuclear parameters (studies which have required extensive use of the high speed digital computers), the continuation of the neutrino experiment conducted at Savannah River, and the development of the Van de-Graaff accelerator as a tool for research and teaching in nuclear physics.

The program in the reflection of radio waves from meteor trails has expanded. The major annual meteor showers have been observed through the use of the transmitter operated by the University of Tennessee at Knoxville and the Tech receiver at Smyrna. In addition to the analysis of the shower

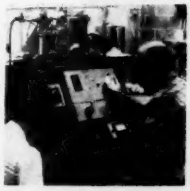
data, studies have continued on the sporadic radiant distribution and on analytical approximations of the distribution. The effects of the observed distribution on the communications potential for a variety of links, and the optimum antenna configuration for various conditions have been studied.

DEFENSE BRANCH

In the Defense Branch, research in the field of countermeasures continued with emphasis on the evaluation of techniques. This classified project, including simulation analysis of satellite orbits with the analog computer, is terminating at the end of the year.

Dr. Koga, Dr. Fukuyo and Mr. Tsuzuki, all from Japan, participated in research on quartz crystal resonators. This work included measurement of vibrations of circular crystals in the vicinity of the fundamental mode, and rectangular crystals near the third overtone at 3 mc.

The Station's experimental work on the application of quartz crystals to frequency control in the frequency range 150-300 mc was completed. Sponsored studies in the application of crystals and the design of associated oscillator circuits were continued and resulted in satisfactory frequency control in this new frequency region.



As an outgrowth of the previous year's work on physiologic instrumentation aids for the Emory University Pharmacology Department, the staff of the Analog Computer Laboratory recently completed development of a transistorized pulsed-current stimulator for use in animal experimentation, and an electro-encephalographic data analyzer to facilitate mass testing of certain drug effects. An ideal sponsored project, entitled New Methods of Analog Computation, provides support and stimulation for the ACL staff.

M. W. LONG, Chief

the

ELECTRONICS

division

THE ELECTRONICS DIVISION established this past year is the logical outgrowth of the Physical Sciences Division. The Radar Branch, one of the branches that make up the Electronics Division has become the largest research group at Georgia Tech. The complementing partner of this new division is the Communications Branch.

COMMUNICATIONS BRANCH

A major part of the research within the Communications Branch is directed toward reducing radio interference between communications systems. Measurement techniques were developed to determine the mutual interference characteristics of transmitters and receivers. Parallel with this program is the development of digital computer techniques to synthesize, from the measured data, minimal mutual interference communication system complexes for a field army through optimum frequency and equipment versus site determination.

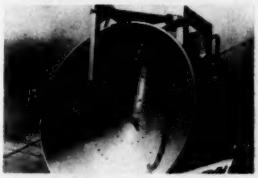
In the ionospheric program of the Communications Branch a field site south of Atlanta, equipped with a pulse sounder and an atomichron, is operated in conjunction with Lincoln Laboratory's similar installation at Ipswich, Massachusetts. Last year studies were made of reciprocity, diversity, and

phase stability associated with propagation phenomena throughout the high frequency region. Observations were also made of ionospheric disturbances associated with rocket launchings at Wallops Island, Virginia.

RADAR BRANCH

The Radar Branch has been studying the feasibility of making narrow beam rapid scanning, precision radar. This past year two new types of radar systems were designed and developed at Georgia Tech's Engineering Experiment Station.

Moon Radar is the title of a project devoted to the detection of long-range targets. Truly exploratory, this study's objective is to determine the feasibility of detecting echoes from the moon, or other long-range targets, with a low power transmitter and a small antenna. Results of the study indicate that, with a suitably designed system, improved sensitivity can be attained through the use of a "completely linear" second detector to reduce the effective system noise bandwidth.



The Radar Branch continued to make contributions consistent with its national reputation for antenna research and development. Two new types of antenna systems were designed which employ highly directional geodesic Luneberg lenses. This is an outgrowth of research at Georgia Tech where basic design principles for geodesic lenses were developed. Planned uses for these antennas by contracting agencies will result in the improvement of current capabilities of microwave sensory equipment.

Two mutiple reflector, rapid scanning antenna systems were also developed during the year. The antennas have unique polarization and bandwidth characteristics; the new concepts developed to attain these characteristics represent significant contributions to the antenna field.

W. H. ATCHISON, Head

the

RICH ELECTRONIC COMPUTER

center

TWO MAJOR changes took place in the Computer Center during the past fiscal year. The primary one was a considerable increase in the research activity, which was made possible largely by the National Science Foundation grant to support research requiring digital computation. Thirteen separate projects were undertaken in this connection. Eleven are basic research activities, and the other two are related supporting work, namely, the development of Tech's

computer library and the continued improvement of the UNIVAC SCIENTIFIC (ERA 1101).

In addition to the research supported in part by the NSF, work continued on the problems of satellite orbit computation and communication interference. These projects show considerable promise for new contributions to their respective fields.

The second major change at the Computer Center was the absorption of the increased computing facilities. The new 4,096-word core memory addition first went into operation in July 1959, and led to a considerable increase in use of the UNIVAC SCIENTIFIC (ERA 1101). This work has mostly been in connection with coulomb effects in beta decay, and transport properties of an ionized gas. The presence of the immediate access core memory has necessitated rewriting essentially the entire program library for the 1101 in order to effectively utilize the increased speed of the machine. This task has been accomplished as required by the various research projects.

Several projects made use of the special capabilities of the Burroughs 220. A general routine was written for the 220 library that would handle large scale linear programming problems, and this routine was used to solve an industrial production problem that involved a 31 by 859 matrix. For another industrial sponsor a two-week training course in programming the 220 was conducted for 13 members of the sponsor's staff in the summer of 1959. Since then the sponsor has provided all the project planning, analysis, and programming for the company's projects.

The work on the card input-output unit for the UNIVAC SCIENTIFIC (ERA 1101) progressed slowly because of limited manpower available for its design. Also dependent on this progress is the greater use of an algebraic compiler. When the card in-

put-output unit is completed, the compiler will be available on the 220 and shall afford a common language for all three of the Computer Center's machines.

Seminars on how to use the IBM 650 have continued to be offered to the students and faculty each quarter. As a result of these seminars, the use of the 650 did not appreciably diminish when the 220 was installed. These seminars will continue to be offered in the hope that all students will have had some experience on a computer before graduation.

Again this year the computational and data-processing work done at the Computer Center has encompassed a great variety of subject matter. A research project in religion from another University was greatly facilitated by machine tabulations of answers to 3,000 questionnaires. For an engineering firm a program was developed for the design of tapered girders. A project for a Federal agency concerned water surface profile computations for 75 valley cross sections for a watershed in South Georgia. A Georgia Tech graduate student's study of waiting lines in a hospital emergency clinic required machine computations.

The project concerning language translation, which is supported by a National Science Foundation Grant and is being carried out in cooperation with the Massachusetts Institute of Technology, continued through the year. The chief interest of this investigation is the syntactic study of German adverbials within the domain of the sentence.

One of the projects of the Statistical Analysis Group involved the use of both analog and digital computers in spectral analysis of ocean waves. Monte Carlo studies are being carried out using the electronically simulated mechanical devices. The object of this work and associated theoretical studies is to predict certain ocean wave configurations of interest to the Navy.

K. C. WAGNER, Head

the

INDUSTRIAL DEVELOPMENT

branch

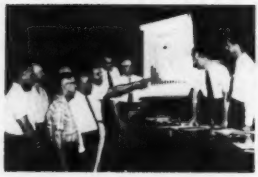
NEW MANUFACTURING PLANTS already brought into the State of Georgia as a direct result of the Industrial Development Branch's research are expected to contribute $600,000 per year in new taxes. This annual return is 50 per cent more than the total State funds invested in the program during its first four years of existence. These

results are especially interesting in view of the fact that much of the work completed to date has been basic in nature and not expected to bring results until it is used in applied work. Also, much of the applied work done thus far has not yet had time to bring results.

Industrial development workshops were held in 77 counties during the year. Forty were sponsored by the Georgia Power Company, 31 by the Georgia Electric Membership Corporation and the Department of Commerce, and more were jointly supported by the three organizations.

A need for technical assistance has been pointed up by the Small Business Administration project, which has as its aim the identification and analysis of the problems and needs of small manufacturers. This study is expected to be completed in July. Two points are particularly worth noting here: first, the fact that expansion of established industry is a vital and often badly neglected part of most development programs; second, a limited amount of technical assistance can make the difference between business failure and continued, successful operation.

IDB DIRECTS A . . . .



The establishment of "field offices" or sub-stations in key locations throughout the State, authorized by a bill passed by the 1960 General Assembly, will ultimately provide the means needed to effectively carry the technical assistance program to the local level. To date, at least five communities have indicated an active interest in securing such offices.

Continuing the work begun for the Georgia Department of Commerce two years ago, nine additional product-industry studies were completed during the year, four with Branch funds. Each points up a specific product or industry which offers manufacturers an excellent opportunity in Georgia. An exploratory study of a wide range of

manufacturing operations which have successfully located in small towns in other states was also completed. Work was begun during the year on a related study, a chemical industry manual which will cover the many attractions the State offers this important industry, from raw materials to good water sites and expanding markets.

Analysis of the industrial and economic potentials of specific areas continued, with the addition of contracts with the Rome-Floyd County Planning Commission and the City of Thomasville. Work on the first such study, undertaken for Valdosta three years ago, was completed during the past year. Most of the project work for Brunswick, Columbus, and Macon was also finished, although some research, consultation and service work continues with each. Efforts during the coming year will be concentrated on actually securing new manufacturing plants for the cities for which the analysis of industrial potentials has been completed. Brunswick has already secured one multi-million dollar installation as a result of IDB's work.

Another issue of *IDeas,* a publication that has proved to be quite popular, was produced during the year. Focusing on little known facts about Georgia's economy, the issue provided a report on the increasing importance of manufacturing, and therefore of engineering and science, in the State's economy.

A special report in process will go more deeply than any previous study into the problems of Georgia's present economic weaknesses. A major aim is to evaluate Georgia's progress in recent years in comparison with other states and the U. S. Specific recommendations will be given as to steps which can assure the more rapid development of Georgia's vast industrial potentials and the strengthening of the State's existing economic structure.

. . . . WORKSHOP IN THOMASVILLE

R. J. KYLE, Head

the

TECHNICAL INFORMATION

section

THE COMPILATION of catalogs of military antennas was the center of activity in the Technical Information Section for the second straight year. Several other major studies were undertaken during the year, bringing the total activity to double that of last year. One of the largest projects was the setting up and maintaining of a file of several hundred references in the field of solid state physics, a project that included translation work and several other services. Also, the compilation of literature on peanut technology was continued.

Literature studies in the fields of metal and dielectric thin films (five bibliographies), atmospheric physics, hafnium, geodesy, radioisotopes for wear and mixing studies, and depilatories were also performed. Two other major studies were begun: collecting and abstracting the information on engineering curricula for the last decade, and an extensive study of ceramic materials for nuclear reactor cores.

Supplying technical information to industries in friendly countries is an activity which the Technical Information Section has performed under contract with the U. S. Government for over nine years. This year eleven studies were performed for Yugoslavia, Venezuela, Jordan, Israel, Southern Rhodesia, and Nicaragua. An experiment is now in progress to evaluate the feasibility of a series (or manual) of brief reports for use in underdeveloped countries. The reports will concern production techniques for basic chemical products.

The Monthly Literature Review, an internal publication tailored to the needs of the Georgia Tech research programs, completed its seventh year of publication.

The Special Monthly Literature Review, Analog Computers has been continued for the benefit of the Georgia Tech Analog Computer Laboratory staff and for analog computer facilities throughout this country and abroad.

The Technical Information Section maintains a directory of individuals on the campus and nearby who are qualified to make technical translations in various languages. The translation requirements of the Institute have continued to increase.

A weekly series of seminars on the use of computers for translation is being conducted. It is hoped that Georgia Tech will be able to begin a machine translation program from English to Spanish in the near future.

Edited in Retrospect

• In a political year such as this one, the phrase, "man of vision," tends to be overexposed. The rantings of candidates, friends of candidates, and enemies of candidates (who suddenly blossom out as friends of candidates) have a marked tendency to weaken what once was a strong grouping of words applied to but a few men.

In our limited span of experience, we have come in contact with less than a handful of men possessing this characteristic and the necessary companion trait of "the courage to stand up and fight for their vision."

One of these necessary-for-future-growth people in our lifetime was William E. Mitchell, who died in Atlanta on July 31 at the age of 78. Mr. Mitchell, a graduate of MIT and a retired president of The Georgia Power Company, was one of the best friends Georgia Tech ever had. He became interested in Tech when he first joined Georgia Power as vice president in 1927. But, this interest really became activated in 1947 when he was named to the Board of Trustees of the Georgia Tech Research Institute. Six months after he joined the Board, he was named its chairman, a title he held with distinction until his death.

Mr. Mitchell held a great number of government and civic positions (among them the second highest post in the Economic Cooperative Administration for France, a part of the Marshall Plan). He received the salutes of his countrymen and those of other countries as well (among them the French Legion of Merit for his work with ECA). But, he gave as much or more of his energies and vision to Tech research than to any of his various activities. He was one of the handful of men who pushed Tech research to its present place of regional and national leadership. When he joined GTRI, Tech research totaled around $300,000 a year. When he died, it was up to over $4,000,000 a year.

William Mitchell was an engineer, a statesman, an executive, and a civic leader of high, uncompromising standards. But, above all he was a man who saw the future clear and acted on his vision. Our great worry for tomorrow should be that they don't seem to be producing men like Bill Mitchell anymore. And, where will education be when there are no more like him?